MASS MEMORY FILE

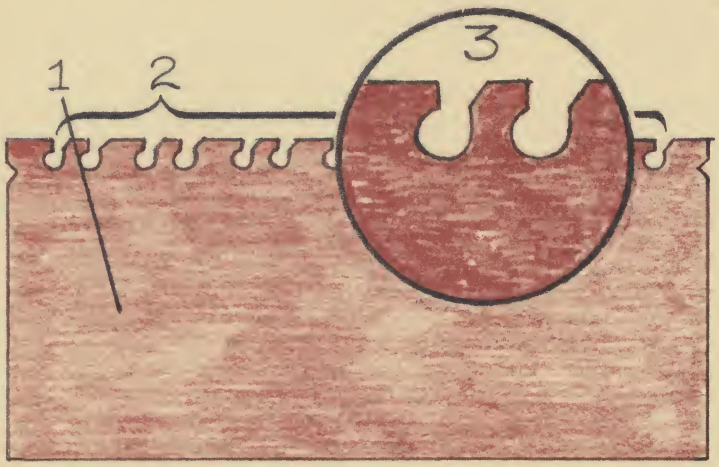
A NEW GENERATION IN RANDOM ACCESS MASS STORAGE FROM

HONEYWELL

Honeywell's Mass Memory File adds a powerful new dimension in random access mass storage to Series 200 computers. Available in three different units, the Mass Memory File provides an exceptionally wide range of capacities (from 15 million to over 2 billion characters) and millisecond speeds (average access times range from 95 to 225 milliseconds). Extremely compact, the units are designed for new standards of reliability and offer the most attractive cost/performance ratios in the industry.

DATA IS STORED ON STRIPS OF MAGNETIC TAPE

The basic storage medium is a magnetic tape strip (1) of approximately the same size as a punched card. A series of tracks running along the length of the strip contains recorded data — up to 123,900 characters per strip. The basic handling unit is a cartridge containing 512 tape strips. The cartridge and tape strips weigh approximately 5 pounds.

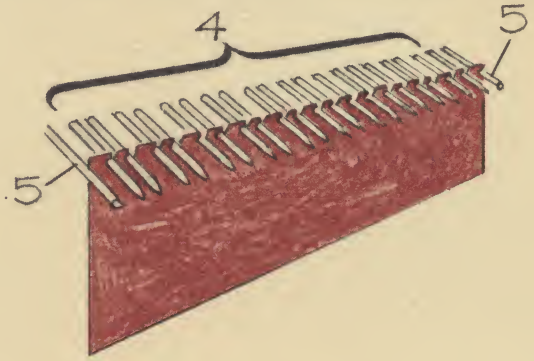


DUAL NOTCHES INSURE RELIABLE SELECTION AND OPERATION

Each tape strip is notched in ten positions along its top edge (2). Nine notch positions are sufficient to provide a unique notch configuration for each strip. A tenth position is used to insure that each strip is supported in at least two positions. This eliminates any tendency for strips to fall accidentally. Another important design feature is the use of two notches in each notch position (3). Dual notches permit more precise positioning of the selection rods, and less rotation is required to effect release of the selected tape strip.

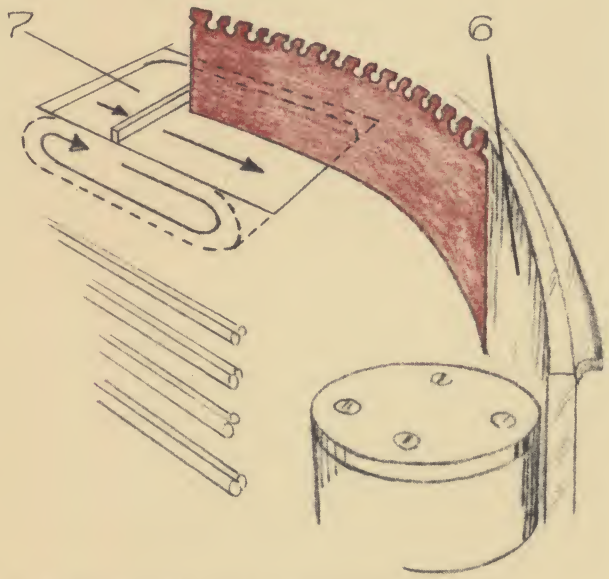
GATING RODS PROVIDE PRIMARY TAPE STRIP SUPPORT

When a cartridge is positioned in a transport, selection rods (4) pass through the address notches of all the tape strips. Two gating rods (5) are positioned in V-shaped notches, one at each end of the strips, and the cartridge case is withdrawn. The gating rods provide complete support for the strips until the selection rods have been positioned to address the specific strip desired. At this point the gating rods rotate, transferring support of all but the desired strip to the selection rods. The selected strip drops a fraction of an inch, and the gating rods rotate back into place and reassume full support of the strips.



TAPE STRIP SELECTION IS FAST, GENTLE AND PRECISE

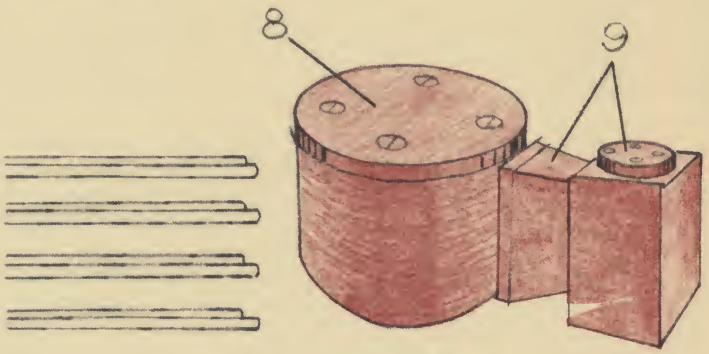
A specific tape strip is addressed by rotating those selection rods that match the individual notching pattern of the strip. This permits the selected strip to drop to a waiting platform when the gating rods are opened. Key factors in the high speeds and reliability achieved in this selection process are the relatively small size and mass of the tape strip, the minimal contact between the selection rods and the tape strip notches, the use of dual notch positions, and the short distance (¼ inch) the selected strip drops when released.



ACCELERATION IS UNDER PRECISION CONTROL

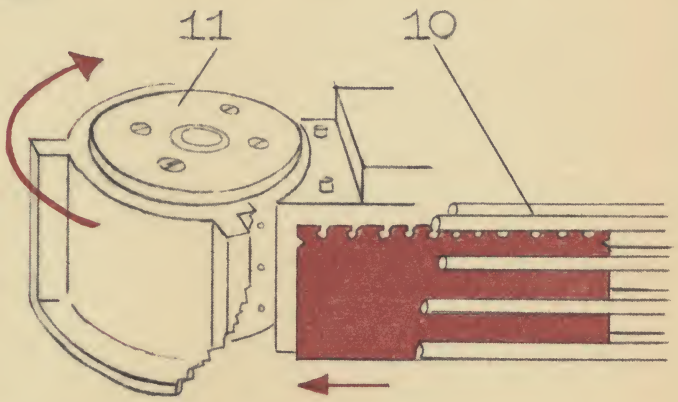
The strip is moved onto a raceway (6) by an accelerator bar positioned directly behind the waiting platform (7). The accelerator bar, stationary until the strip is dropped, gradually accelerates the strip down the raceway where it

is drawn onto the read/write drum (8) by vacuum. Transport of the strip during this all-important acceleration interval is gentle and precise — no gripping, slapping, or rough handling of any kind.



DATA TRANSFER RATE: 100,000 CHARACTERS PER SECOND

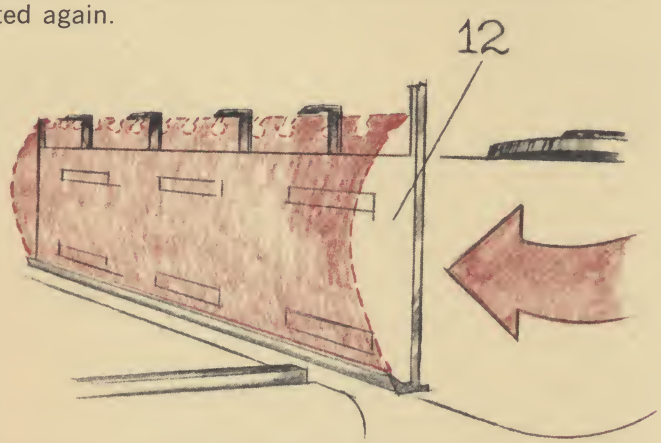
When the strip arrives at the drum, the read/write head assembly (9) is positioned and data transfer takes place at the rate of 100,000 characters per second. A unique verify operation, specified in the data transfer instruction, performs a reading check on the data written. This same operation decreases the sensitivity of the sense amplifiers, enabling them to detect any marginal or substandard areas on the recording surface that could eventually lead to problems. If a substandard area is detected, the operator is alerted and proper corrective steps can be taken.



RETURN IS SMOOTH AND POSITIVE

Programmed instruction directs the strip to leave the read/write drum. If the instruction is not given, the transport automatically orders the strip's return after a short period of time. This prevents the strip from whirring around indefinitely in the event of a program error.

When the strip is released from the drum, it glides down a return raceway (10) under its own momentum — no force is exerted in any way. It curves around a deceleration capstan (11) which slows the strip for its approach to the lift plate (12). The strip comes to rest on the lift plate in a controlled glide: a series of vacuum ports on the plate are covered successively by the back (non-data) side of the strip, and the strip is gently brought to a halt. The plate rises one-quarter of an inch. The selection rods contain slots that permit the tape strip notch tabs to pass without contact. A puff of air moves the strip past the slots onto the selection rods where it is ready to be selected again.



YOUR RECORDS ARE PAMPERED AND PROTECTED AT ALL TIMES

Tape strips and their data are protected by every possible safeguard. When stored off-line, they're sealed in dust-proof cartridges. While being moved from shelf storage to the transport, they're locked securely in the cartridges. During transport operation, the data side of the strip is never touched. No belts, pulleys, or rollers are used to advance the strip.

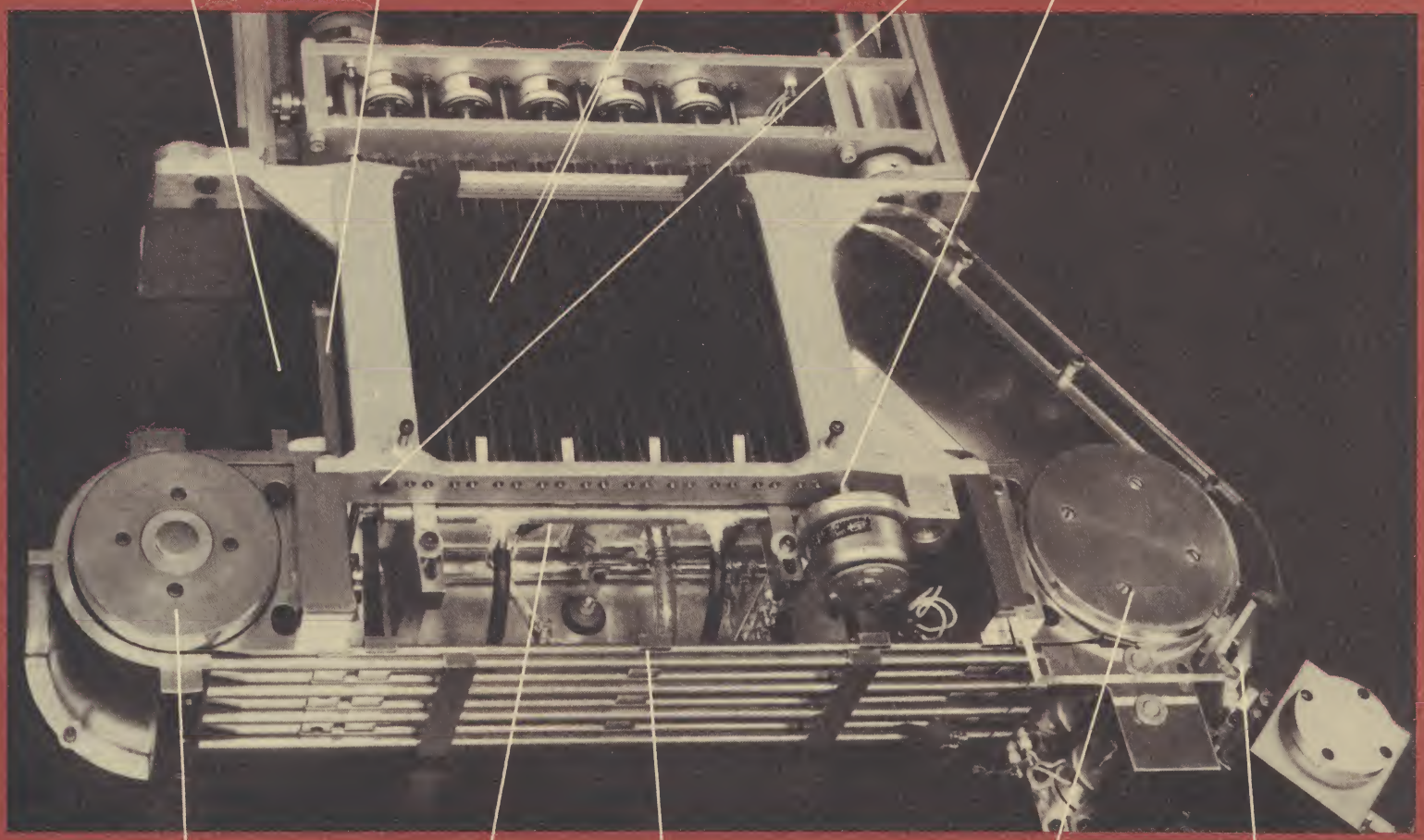
The strip is moved by compressed air and "handled" by vacuum during its entire journey (except for the gradual sweep of the accelerator bar). Interlocks prevent any possibility of two or more tape strips occupying the same position at any point in the cycle. Photoelectric checks are performed along the way to make sure that the strip reaches specified "check points" at the precise times.

PREVENTIVE MAINTENANCE DETECTS TAPE STRIP WEAR

Tens of thousands of selections can eventually cause tape strip notches to wear. A preventive maintenance utility routine that takes only a minute to run is provided by Honeywell. This routine activates the selection rods in such a way that wear can be detected before it becomes excessive, and the strip can be copied and replaced.

PROGRAMMING ERRORS ARE DETECTED AUTOMATICALLY

In addition to the automatic release of the strip from the read/write drum, a trio of file-protection techniques is used to protect program files, data files, and any other type of programmer-designated file from unintentional programmed alteration. Also, the control unit automatically detects inactive and incorrect addresses. The operator is alerted and no further commands are executed until corrective action is taken.


ACCELERATOR BAR
GATING RODS
WAITING PLATFORM
SELECTION RODS
LIFT PLATE
READ/WRITE DRUM
DECELERATION CAPSTAN
READ/WRITE HEAD
RETURN RACEWAY

HONEYWELL'S MASS MEMORY FILE PROVIDES FASTER ACCESS TO MORE INFORMATION THAN ANY COMPETITIVELY PRICED STORAGE SYSTEM

MASS MEMORY FILE TRANSPORT	STORAGE CAPACITY			SPEED	
	DATA CHARACTERS PER TRANSPORT	TRANSPORTS PER CONTROL	DATA CHARACTERS PER CONTROL	ACCESS TIME (Average)	DATA TRANSFER RATE
Type 251	15.8 Million	8	126.9 Million	95 ms	100,000 Chars./Second
Type 252	63.4 Million	8	507.5 Million	150 ms	100,000 Chars./Second
Type 253	63.4 to 317 Million	8	2,537.5 Million	225 ms	100,000 Chars./Second

- UNIFIED SYSTEM APPROACH: From 15 million to over 2.5 billion characters can be stored and retrieved through a single control unit. A number of control units can be connected to each Series 200 computer, e.g., up to 32 on the Model 4200.
- GRADUAL MEMORY EXPANSION: System grows gradually in 15-, 60-, or 300-million character increments. No big jumps from small to large storage systems.
- SAME STORAGE MEDIUM THROUGHOUT: Identical tape strips can be used in any system configuration. No reinvestment in different recording media and no reprogramming required as the system is enlarged.
- SIMULTANEITY: Eight "seek" operations can be performed simultaneously with a read or write operation.
- FASTEST ACCESS TIMES: Access times are faster than those of any competitively priced system.
- SAME-STRIP PROCESSING: Access times are significantly reduced when processing records on the same strip (8.35 or 16.7 milliseconds, depending on read/write head movement).
- FASTEST TRANSACTION TIMES: The total access, read, and write operation — the true speed test of a random access device — is faster than that of any competitive device.
- FLEXIBLE FILE DESIGN: Variable-length record locations make optimum use of storage surface. There are no fixed-length "sectors" to make record sizes conform to hardware design.
- TRACK-LINKING RECORD: This feature allows continuous and automatic track-to-track recording, performing such operations as chaining, overflow record handling, and program control.
- EASILY REPLACEABLE MEDIA: Cartridges may be loaded or replaced in less than a minute.

ACCESS TIME AND COST-PER-CHARACTER ARE COMMON DENOMINATORS FOR COST/PERFORMANCE COMPARISONS:

CLASS 1

DEVICE	TYPE 251	DISK	DISK	CARD	CARD	CARD
STORAGE CAPACITY	15 million	3 million	7.3 million	5.5 million	8 million	16 million
ACCESS TIME	95 ms	270 ms	97.5 ms	258 ms	258 ms	258 ms
COST/ CHARACTER*	.0065¢	.050¢ or .036¢	.015¢	.017¢	.0087¢	.0052¢

CLASS 2

DEVICE	TYPE 252
STORAGE CAPACITY	60 million
ACCESS TIME	150 ms
COST/ CHARACTER*	.0024¢

CLASS 3

DEVICE	TYPE 253	CARD	STRIP
STORAGE CAPACITY	300 million	341 million	400 million
ACCESS TIME	225 ms	408 ms	575 ms
COST/ CHARACTER*	.00084¢	.0011¢	.00088¢

Cost per character is the monthly rental of the storage device and control divided by the maximum capacity of the device.

Honeywell

ELECTRONIC DATA PROCESSING

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